POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1939	h m		°	°	°	°				
May 31..	10 35	6470	−51	79	−21	54	436	21	VG	U. S. Naval.
		6471	−49	81	+13	51	242	6		
		6469	−38	92	−8	39	145	7		
		6473	−35	95	−12	37	97	7		
		6466	−34	96	+10	35	48	15		
		6468	−33	97	−17	57	12	3		
		6465	−23	107	+7	25	388	20		
		6464	−10	120	+22	25	12	6		
		6463	−3	127	−15	16	6	3		
		6472	+27	157	−22	33	12	2		
		6457	+20	159	+20	35	97	2		
		6457	+35	165	+19	40	12	3		
		6456	+39	169	−19	43	145	14		
		6452	+59	189	+25	46	339	23		
				(130)	−1		1,991	132		

Mean daily area for 31 days, 1,865.
Plate quality: F, fair; G, good; VG, very good.

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR MAY 1939

[Dependent alone on observations at Zurich]

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

May 1939	Relative numbers	May 1939	Relative numbers	May 1939	Relative numbers
1	*Ec* 163	11	101	21	*EWcc* --
2	*aad* 157	12	*EEcc* --	22	--------
3	*133	13	*Maac* 121	23	*a* --
4	141	14	*aad* --	24	*Eac* 106
5	*ab* 124	15	139	25	--------
6	115	16	118	26	97
7	*add* 133	17	*d* 93	27	*d* 104
8	*d* --	18	*d* 79	28	*ad* 138
9	--------	19	79	29	*add* 172
10	*EMcc* 128	20	--------	30	157
				31	146

Mean, 22 days=124.7.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity. *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, on the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.
*=Chur.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in charge]

By B. FRANCIS DASHIELL

The results of 690 individual upper-air observations made during May by airplanes and radiosonde in the United States, Canal Zone, Hawaii, Canada, Bermuda and the north Atlantic, are shown in tables 1 and 1a. Mean atmospheric pressures, temperatures, and resultant winds are indicated on charts VIII, IX, X, and XI. Isentropic data are shown on chart XII. Tables 2 and 3 present upper-air wind data and table 4 gives the mean altitude of the tropopause. A detailed description of these charts and tables will be found in the January 1939 issue of the MONTHLY WEATHER REVIEW.

In the lower levels where observations are made by radiosonde and airplanes, many flights reached all levels. Of the 320 airplane observations made in the United States proper, 80 percent reached 5 kilometers. But, of all the 311 radiosonde flights launched at the surface, 98 percent reached 5 kilometers. And, in the higher levels, 92, 79, and 25 percent of all flights reached 10, 15, and 20 kilometers, respectively. Means were computed for the 22-kilometer level over Nashville, Tenn., Omaha, Nebr., and Washington, D. C., while a few individual flights went even higher; 25 kilometers over St. George's, Bermuda, and 24 kilometers over Omaha, Nebr.

The May mean free-air pressure, temperature (° C.), and humidity, given in table 1a, also includes radiosonde observations for the first time from Barksdale Field, Shreveport, La., and the United States Coast Guard cutters *Champlain* and *Chelan*, when located at Halifax, Nova Scotia, or in an area at sea lying between latitudes 40° and 44° N. and longitudes 47° and 53° W.

A low mean-pressure area prevailed to the north and east of the Great Lakes, then northeastward indefinitely toward Hudson Bay and Newfoundland. However, the lowest pressure in the United States at 1.5, 3, 4, and 5 kilometers, was centered over Sault Ste. Marie, Mich. But it was found that pressures far to the east, over Halifax, Nova Scotia, were still somewhat lower. On the other hand, pressure was higher east of Halifax, Nova Scotia, for observations by Coast Guard ships at sea (table 1a) revealed pressures that were from 2 to 3 millibars higher than those recorded over Sault Ste. Marie, Mich., at all levels. The highest pressures were located in the south, being centered generally over St. George's, Bermuda, and Pensacola, Fla.

During May low mean pressure prevailed over Fargo, N. Dak., up to 1.5 kilometers; over Sault Ste. Marie, Mich., up to 16 kilometers; and over both stations from 17 to 20 kilometers. The highest mean pressure from the surface up to 1.5 kilometers predominated over St. George's, Bermuda, and then at Pensacola, Fla., up to 5 kilometers. Highest pressure then was located over St. George's, Bermuda, at 5, 6, 7, and 8 kilometers, being exceeded by Shreveport, La., at 9, 10, and 11 kilometers, and Nashville, Tenn., at 12, 13, 14, 15, 16, 17, and 18 kilometers, and Washington, D. C., at 19, 20, 21, and 22 kilometers.

The pressure differences between the LOW and HIGH areas at Halifax, Nova Scotia, and Bermuda increased steadily with altitude, varying from 7 millibars at 0.5 kilometer to 19 millibars at 5 kilometers. Similar differences between the two pressure extremes within the United States (Sault Ste. Marie, Mich., and Pensacola, Fla.), showed slightly smaller increases with altitude, ranging from 5 to 14 millibars at 0.5 to 5 kilometers, respectively.

Mean free-air temperatures (° C.) during the current month were seasonally warmer than in April at all radiosonde stations in the lower levels, but slightly colder than those recorded in April at the upper levels, with the exception of Oakland, Calif. At Fargo, N. Dak., the mean temperature at 17 kilometers (—61.8° C.) was the lowest recorded over that station since October 1938.

In the lower levels, up to 5 kilometers, mean temperatures for May were lowest over Halifax, Nova Scotia, and highest over El Paso, Tex., at 1.5, 3, and 4 kilometers, and over Pensacola, Fla., at 5 kilometers. Above 5 kilometers, mean temperatures were highest over Shreveport, La., up to 11 kilometers; over Oakland, Calif., at 12, 13, and 14 kilometers; and over Sault Ste. Marie, Mich., from 15 to 20 kilometers, inclusive. The lowest mean temperature recorded in May in the upper air was —65.8° C. over St. George's, Bermuda, at 15 kilometers; in the United States, —64.3° C. over Nashville, Tenn., at 17 kilometers.

Mean relative humidity in the United States was lower than usual in the free air, the highest percentage being recorded at San Diego, Calif., at 0.5 and 1 kilometer; at Pensacola, Fla., at 1.5 and 2 kilometers; over Sault Ste. Marie, Mich., at 3 and 4 kilometers; over Salt Lake City, Utah, at 5 kilometers; and over Fargo, N. Dak., at 6, 7, 8, and 9 kilometers. The humidity over St. George's Bermuda, at 0.5, 1, 1.5, and 2 kilometers, was the highest reported during May. Dry air was centered in the lower levels over Omaha, Nebr., and Spokane, Wash., at 0.5 and 1 kilometer. Relative humidity ranged from 24 to 33 percent over El Paso, Tex., at 2, 2.5, 3, 4, and 5 kilometers, respectively, while above 5 kilometers the driest air was centered over Oakland, Calif., and Bermuda.

Resultant wind directions and velocities were computed during May for 115 pilot-balloon stations in the United States, Canada, Mexico, Cuba, and Bermuda. These included data for new stations at Elmira, N. Y., Mobile, Ala., San Antonio, Tex., and Springfield, Mo. Table 2 presents a list of 39 selected stations with computed resultants for all standard levels. Improvement in the number of observations made at higher levels was noted. Comparing the current month with April it was found that this increase amounted to 15, 18, and 25 percent, at 3, 4, and 5 kilometers, respectively. All stations listed in table 2 computed 5 p. m. resultants for all levels up to 2.5 kilometers; 87 percent up to 5 kilometers; 67 percent at 6 kilometers; 34 percent at 8 kilometers; 21 percent at 10 kilometers; and 13 percent at 12 kilometers.

During the current month there was a decided increase in the maximum altitudes reached by pilot balloons. It was found that 70 percent of the stations in the United States averaged at least 2.5 kilometers higher in May than in April. But in the Northwest and along the Pacific coast the maximum altitudes reached were lower in May by an average of 1.5 kilometers. At Miami, Tampa, and Jacksonville, Fla., maximum altitudes were 7 kilometers higher than in April. Highest altitudes were reached by individual ascensions at Abilene, Tex. (19,467 meters); San Antonio, Tex. (19,113 meters); and Denver, Colo. (18,597 meters). At 20 percent of all stations in the United States maximum altitudes exceeded 15 kilometers; at 70 percent elevations higher than 10 kilometers were reached; and all stations exceeded 5 kilometers during the month. The latter portion of May appeared suitable for high-altitude balloon observations—the 19th, 20th, and 21st over the Western Plains States from Texas to the Dakotas; the 23d and 24th in the Southeast; and the 30th over the Mississippi Valley. Most stations took advantage of the opportunities presented by the conditions existing on those days.

The 5 a. m. (E. S. T.) resultant wind directions at 1.5 kilometers (chart VIII), were mostly from the southwest quadrant over the eastern two-thirds of the country, except in the extreme Northeast and in Canada. Southeasterly winds occurred in 13 percent of all cases, being confined to the far South and Gulf of Mexico countries. Northwesterly wind directions, representing 36 percent of all cases, prevailed in the far North, Northwest, and along the Pacific coast, as well as in Canada. But, at 3 kilometers (chart IX), southwesterly winds predominated only in the South and Southwest, while winds from the northwest quadrant (55 percent of all cases) occurred elsewhere within the United States, as well as Canada. About 2 percent of the winds at this level were southeasterly. However, resultant winds computed from the 5 p. m. (E. S. T.) observations for both the above-mentioned levels (1.5 and 3 kilometers) showed a more definite tendency to fall within the southwest quadrant. At 1.5 and 3 kilometers, respectively, 68 and 60 percent of all directions were southwesterly.

In the lower levels, southeasterly winds ranged from 35 percent of the total at the surface to 15 percent at 1 kilometer. Above 3 kilometers, at 5 p. m., the percentage of northwest wind directions (charts X and XI, and table 2) gradually increased. At 4 kilometers the winds were equally divided between the southwest and northwest quadrants, and at 5 kilometers 60 percent of the resultants were northwesterly. Southwest winds in these levels were confined to the South, some in the far West, and generally over the Pacific coast. Wind directions above 5 kilometers were definitely from the northwest quadrant, reaching 78 percent of the total at 8 kilometers.

Resultant wind velocities during May were lower than in the preceding month. Highest velocities occurred over the Northeast, the upper Mississippi Valley, and the Southwest, at 1.5, 3, 4, and 5 kilometers. The extreme velocities for May were 9.2 meters per second at Del Rio, Tex.; 10.8 m. p. s. at Elmira, N. Y.; and 15.5 m. p. s. at Sault Ste. Marie, Mich., and Buffalo, N. Y., at 1.5, 3, 4, and 5 kilometers, respectively. In the higher levels resultant wind speeds of 17.2 and 20.6 m. p. s. were recorded over Winslow, Ariz., at 10 and 12 kilometers, respectively.

Comparing the 5 a. m. (E. S. T.) resultants (charts VIII and IX) with 5 a. m. normal resultants computed for 21 representative stations in the country, it was found that the wind directions for May at the 1.5-kilometer level departed from normal by counterclockwise orientations. These departures were pronounced at Atlanta, Ga. (the difference being 49° when rotated counterclockwise away from normal), and Oakland, Calif. (42°—counterclockwise). At 3 kilometers the counterclockwise departures were outstanding at Chicago, Ill. (39°); Medford, Oreg. (34°); Oakland, Calif. (35°); Omaha, Nebr. (33°), and Sault Ste. Marie, Mich. (27°). Velocity departures from normal during May were unimportant at 1.5 and 3 kilometers, except over Fargo, N. Dak., where the current winds were respectively 3.0 and 5.1 m. p. s. greater than normal.

Resultants based on 5 p. m. (E. S. T.) observations, when compared to existing 5 a. m. normal resultants for the surface and up to 5 kilometers, show that the May departures were in general characterized by counterclockwise rotations from normal. This was particularly noticeable at Atlanta, Ga., Cheyenne, Wyo., Chicago, Ill., Sault Ste. Marie, Mich., San Diego, Calif., and Oklahoma City, Okla. At Cheyenne, Wyo., for instance, the current winds departed from normal by 78°, 90°, 64°, 50°, 24°, and 21°, at the surface and 2, 2.5, 3, 4, and 5 kilometers, respectively. At San Diego, Calif., the departures amounted to 91°, 12°, 21°, 26°, 30°, 20°, 44°, 21°, and 33°, at the surface and up to 5 kilometers, respectively.

Stations with outstanding clockwise departures in the lower levels, and then changing to counterclockwise in the upper levels, were: Medford, Oreg., Fargo, N. Dak., Houston, Tex., Nashville, Tenn., and Seattle, Wash. At St. Louis, Mo., and Washington, D. C., large counterclockwise departures were indicated up to 2 kilometers, and then clockwise above. Resultant velocity departures from normal were large in some cases, being greater than normal at all levels over Fargo, N. Dak., Atlanta, Ga., Sault Ste. Marie, Mich., and Seattle and Spokane, Wash. This situation was outstanding at Fargo, N. Dak., and Sault Ste. Marie, Mich., above 2 kilometers. Elsewhere, velocities were lower than normal, being noticeable at Oakland, Calif., Omaha, Nebr., and Nashville, Tenn.

Resultant wind directions (based on 5 p. m., E. S. T. observations), shown in table 2, were decidedly more southerly during May than those observed in the preceding month. At all levels, particularly at Cheyenne, Wyo., Atlanta, Ga., Huron, S. Dak., Oklahoma City, Okla., Omaha, Nebr., Reno, Nev., and Winslow Ariz., the directions were generally south of those noted in April by a counterclockwise departure. The few exceptions having winds in May that were more northerly than in April, were Buffalo, N. Y., New Orleans, La., Sault Ste. Marie, Mich., Washington, D. C., Greensboro, N. C., and Brownsville, Tex. Over these stations the northerly, or clockwise, departure changes occurred at higher levels only. Velocities were lower in May than in April at all levels, particularly at Brownsville, Tex., Omaha, Nebr., and Washington, D. C. The only exceptions occurred over Winslow, Ariz., San Diego, Calif., Las Vegas, Nev., El Paso, Tex., and Sault Ste. Marie, Mich.

Table 3 shows individual maximum wind velocities reached during May. Below 2.5 kilometers, Billings, Mont., reported 47.7 m. p. s.; between 2.5 and 5 kilometers, a velocity of 58.7 m. p. s. occurred over Ely, Nev.; and above 5 kilometers, Redding, Calif., reported 80 m. p. s. (178.9 miles per hour) from the SSW on the 8th at 16.6 kilometers. This occurred at the maximum altitude reached over Redding during May, and equalled the velocity reported there in the previous month of April. It has been exceeded elsewhere only four times, but is the highest wind speed of record over any station at such a high altitude.

MEAN ISENTROPIC CHART FOR MAY 1939,[1] $\theta = 307°$

The mean isentropic chart for May shows a typical summertime pattern; a large warm, moist area extends over the western plateau and is associated with an anticyclonic tongue extending to Chicago. Over the eastern part of the country the typical eastern moist tongue is present; it originates in the Gulf and curves sharply anticyclonically over the Southeastern States. This tongue has a branch extending well over the Atlantic to Newfoundland, as shown by soundings from Coast Guard cutters and from Newfoundland Airport.

This moisture pattern does not seem to correspond well with the distribution of precipitation departures except in the northeast, where large negative departures may be explained by the downslope winds. Much better correspondence is shown with a chart showing the number of days with 0.01 inch or more of rainfall. Frequent rains near the lake regions and over southern Canada perhaps originate in lower layers and so cannot be explained by the isentropic pattern.

[1] This chart and the following discussion have been prepared by the Air Mass Section of the Meteorological Research Division.

TABLE 1.—*Mean free-air barometric pressures (P.) in mb, temperatures (T.) in °C, and relative humidities (R. H.) in percent obtained by airplanes during May 1939*

Stations and elevations in meters above sea level	Altitude (meters) m. s. l.																												
	Surface				500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
	Number of observations	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H	P.	T.	R. H.	P.	T.	R. H.
Billings, Mont. (1,090 m.)	31	890	11.0	64	----	----	----	----	----	----	848	12.9	51	798	9.5	51	751	6.1	52	706	2.3	55	623	−4.7	60	548	−11.5	59
Cheyenne, Wyo. (1,873 m.)	31	811	7.4	69	----	----	----	----	----	----	----	----	----	798	10.5	56	752	9.1	50	708	5.7	51	626	−1.5	54	551	−9.7	59
Chicago, Ill. (187 m.)	31	993	12.8	76	956	14.8	63	901	13.3	62	849	10.6	64	800	7.8	62	753	4.9	57	707	2.0	54	624	−3.8	49	549	−10.0	44
Coco Solo, C. Z.[1] (15 m.)	28	1,010	26.8	88	957	24.1	92	904	21.6	88	854	19.2	87	805	17.3	81	759	15.5	69	716	13.5	57	634	8.3	59	----	----	----
El Paso, Tex. (1,193 m.)	31	879	19.7	27	----	----	----	----	----	----	849	21.7	24	800	18.4	23	754	14.6	23	711	10.6	22	629	1.7	28	555	−6.4	33
Lakehurst, N. J.[1] (39 m.)	29	1,011	12.3	79	957	15.1	64	902	13.2	61	850	10.4	60	800	7.4	60	752	4.3	62	707	1.1	64	624	−4.4	56	550	−10.4	57
Norfolk, Va.[1] (10 m.)	25	1,016	16.8	90	960	18.3	63	905	15.9	58	853	12.4	63	804	9.4	63	756	6.5	59	712	3.8	52	629	−1.8	45	553	−8.0	42
Pearl Harbor, T. H.[1] (6 m.)	31	1,016	21.7	80	960	19.0	80	905	15.1	82	853	12.2	79	803	10.8	67	756	9.7	43	712	7.0	34	629	1.3	25	----	----	----
Pensacola, Fla.[1] (13 m.)	26	1,015	20.6	90	960	20.9	75	905	18.2	70	854	14.8	71	805	12.3	71	758	9.9	63	713	7.1	59	631	0.9	55	557	−4.9	48
St. Thomas, V. I.[1] [2] (8 m.)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Salt Lake City, Utah (1,288 m.)	31	869	11.4	60	----	----	----	----	----	----	848	15.1	48	799	12.4	46	752	9.0	47	708	5.4	50	626	−2.3	59	550	−9.9	61
San Diego, Calif.[1] (10 m.)	29	1,015	15.9	78	958	12.5	83	903	12.6	73	850	13.2	57	801	12.1	46	754	9.4	41	710	6.3	39	628	.3	34	553	−7.0	31
Seattle, Wash.[1] (10 m.)	25	1,016	14.2	62	960	10.5	69	904	8.7	64	850	6.6	57	800	3.9	53	751	1.1	50	706	−1.5	42	621	−7.2	36	----	----	----
Spokane, Wash. (597 m.)	31	945	10.0	66	----	----	----	901	13.8	49	848	10.6	47	799	65	52	751	2.4	54	705	−1.4	56	622	−7.8	54	546	−14.0	49

[1] Navy. [2] Flights discontinued temporarily.

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.
NOTE.—None of the means included in this table are based on less than 15 surface- or 5 standard-level observations.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in °C., and relative humidities (R. H.) in percent obtained by radiosondes during May 1939*

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Barksdale Field, Shreveport, La.[1] (51 m.)				St. Georges, Bermuda[2] (50 m.)				Fargo, N. Dak. (274 m.)				Nashville, Tenn. (180 m.)				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)			
	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.
Surface	22	1,007	19.4	86	26	1,013	20.4	87	31	978	11.0	66	31	994	15.3	84	31	1,016	12.3	83	31	967	16.5	80
500	22	956	19.0	77	26	962	17.9	91	31	952	14.2	62	31	958	17.2	68	31	957	10.3	82	31	954	17.3	76
1,000	22	902	17.9	69	26	907	14.9	85	31	898	14.0	57	31	903	14.5	66	31	902	12.7	58	31	900	17.9	64
1,500	22	851	15.6	63	26	855	12.2	80	31	846	11.6	56	31	851	11.5	70	31	850	11.3	51	31	849	15.2	59
2,000	22	802	12.7	60	26	805	9.7	76	31	796	8.6	55	31	801	8.7	69	31	800	8.8	45	31	800	12.1	57
2,500	22	755	9.7	57	26	758	7.8	61	31	749	5.1	56	31	754	6.1	66	31	752	5.9	43	31	753	9.0	57
3,000	22	710	6.1	54	26	713	5.4	53	31	704	2.1	57	31	709	3.8	60	31	708	3.0	41	31	709	5.9	56
4,000	20	629	.5	48	26	630	−.1	48	31	622	−4.0	58	31	626	−1.2	55	31	625	−3.2	41	31	626	−0.4	50
5,000	18	555	−5.5	44	26	556	−6.0	45	31	547	−10.3	57	31	552	−7.0	53	31	550	−9.1	40	31	552	−6.9	47
6,000	16	486	−11.9	49	26	488	−12.4	39	31	480	−17.5	56	31	485	−13.1	51	31	482	−15.9	39	31	485	−13.5	44
7,000	14	426	−17.2	50	26	427	−20.0	38	31	419	−24.8	54	31	424	−20.1	52	31	422	−23.3	39	31	424	−20.5	40
8,000	10	372	−22.5	49	26	373	−27.6	37	31	364	−32.3	53	31	370	−27.3	53	30	367	−30.8	39	31	370	−27.7	41
9,000	9	325	−29.2	50	26	323	−35.2	36	30	315	−40.1	51	31	321	−34.9	52	30	318	−38.3	39	31	321	−35.5	41
10,000	7	282	−36.9	51	26	280	−43.2	-----	30	272	−48.1	-----	31	278	−42.6	51	29	274	−45.0	-----	31	278	−43.3	-----
11,000	6	242	−43.6	-----	26	240	−51.8	-----	30	233	−54.5	-----	31	239	−50.4	-----	28	236	−50.9	-----	31	239	−50.7	-----
12,000	-----	-----	-----	-----	26	205	−59.9	-----	30	199	−58.9	-----	31	205	−56.3	-----	28	202	−54.6	-----	31	204	−56.7	-----
13,000	-----	-----	-----	-----	26	174	−64.9	-----	30	170	−60.4	-----	31	175	−59.5	-----	28	173	−56.5	-----	31	174	−59.3	-----
14,000	-----	-----	-----	-----	25	148	−65.7	-----	30	144	−59.7	-----	31	149	−60.9	-----	25	147	−57.1	-----	29	148	−59.5	-----
15,000	-----	-----	-----	-----	24	126	−65.8	-----	28	123	−60.4	-----	31	126	−62.3	-----	25	125	−57.9	-----	29	126	−60.0	-----
16,000	-----	-----	-----	-----	22	107	−65.4	-----	27	104	−61.3	-----	30	108	−63.6	-----	25	107	−59.0	-----	28	108	−61.9	-----
17,000	-----	-----	-----	-----	18	90	−64.9	-----	25	88	−61.8	-----	30	92	−64.3	-----	22	91	−60.3	-----	24	92	−63.0	-----
18,000	-----	-----	-----	-----	12	77	−62.6	-----	20	76	−61.8	-----	27	78	−63.8	-----	15	77	−60.3	-----	21	78	−63.6	-----
19,000	-----	-----	-----	-----	11	65	−59.6	-----	10	64	−60.4	-----	22	66	−61.8	-----	12	65	−60.0	-----	12	66	−63.0	-----
20,000	-----	-----	-----	-----	7	56	−55.9	-----	5	54	−59.0	-----	20	56	−58.8	-----	-----	-----	-----	-----	5	56	−60.1	-----
21,000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12	48	−56.1	-----	-----	-----	-----	-----	-----	-----	-----	-----
22,000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5	40	−51.1	-----	-----	-----	-----	-----	-----	-----	-----	-----

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																			
	Omaha, Nebr. (300 m.)				Sault Ste. Marie, Mich. (221 m.)				Washington, D. C.[3] (13 m.)				Halifax, Nova Scotia[4] (5 m.)				At sea[4] (5 m.)			
	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.	Number of observations	P.	T.	R. H.
Surface	31	977	15.8	67	31	987	6.4	87	29	1,015	14.6	80	18	1,015	3.7	-----	30	1,017	8.3	-----
500	31	955	17.4	58	31	955	7.4	80	29	957	14.6	70	18	955	2.5	-----	30	957	8.3	-----
1,000	31	901	16.2	53	31	899	7.2	73	29	902	12.4	64	18	897	1.2	-----	30	901	7.6	-----
1,500	31	849	13.5	51	31	845	5.6	71	29	849	9.4	64	18	843	−1.1	-----	30	847	6.2	-----
2,000	31	800	10.5	50	31	795	3.4	68	29	800	6.3	63	18	792	−3.5	-----	30	797	4.4	-----
2,500	31	752	7.5	52	31	747	1.0	65	29	752	3.3	63	18	743	−5.7	-----	30	749	2.2	-----
3,000	31	708	4.4	53	31	702	−1.7	65	29	707	.7	60	18	697	−7.6	-----	30	704	−.5	-----
4,000	31	626	−2.0	55	31	618	−7.4	60	29	624	−4.2	51	18	612	−12.4	-----	30	621	−5.8	-----
5,000	30	551	−8.0	55	31	543	−13.4	53	29	548	−9.7	48	18	537	−17.9	-----	30	546	−11.6	-----
6,000	30	484	−14.6	52	31	476	−19.8	51	29	481	−15.9	46	18	469	−24.1	-----	30	478	−17.7	-----
7,000	30	423	−21.8	49	31	415	−26.8	48	29	420	−22.9	45	18	408	−30.8	-----	29	418	−23.9	-----
8,000	30	369	−29.4	46	31	361	−34.1	47	29	366	−29.8	44	17	353	−37.9	-----	28	363	−31.3	-----
9,000	30	319	−37.3	45	30	312	−41.4	46	29	317	−37.4	45	16	305	−45.3	-----	28	315	−38.2	-----
10,000	29	276	−44.9	-----	30	268	−48.4	-----	29	274	−44.7	-----	15	262	−51.7	-----	28	271	−44.9	-----
11,000	29	237	−51.8	-----	29	230	−54.9	-----	29	235	−51.3	-----	13	224	−55.5	-----	27	233	−51.4	-----
12,000	29	203	−56.3	-----	28	196	−57.7	-----	29	202	−55.9	-----	8	192	−55.4	-----	26	200	−56.8	-----
13,000	29	173	−57.6	-----	28	168	−57.3	-----	29	172	−59.1	-----	7	164	−54.7	-----	26	171	−58.9	-----
14,000	28	147	−57.5	-----	28	143	−57.2	-----	29	147	−60.6	-----	7	140	−54.6	-----	26	146	−58.3	-----
15,000	27	126	−58.8	-----	26	122	−57.8	-----	27	126	−61.2	-----	5	120	−54.6	-----	24	125	−58.3	-----
16,000	26	107	−60.2	-----	23	104	−58.7	-----	26	107	−61.9	-----	-----	-----	-----	-----	22	106	−58.4	-----
17,000	24	91	−61.0	-----	22	88	−59.1	-----	23	91	−62.4	-----	-----	-----	-----	-----	21	91	−58.2	-----
18,000	20	77	−60.7	-----	17	75	−58.9	-----	18	78	−61.7	-----	-----	-----	-----	-----	18	78	−57.8	-----
19,000	14	66	−60.0	-----	11	64	−58.0	-----	16	67	−60.6	-----	-----	-----	-----	-----	12	67	−57.3	-----
20,000	13	56	−58.6	-----	5	54	−57.8	-----	14	57	−59.7	-----	-----	-----	-----	-----	9	57	−57.0	-----
21,000	11	48	−56.8	-----	-----	-----	-----	-----	7	48	−58.8	-----	-----	-----	-----	-----	-----	-----	-----	-----
22,000	9	41	−54.4	-----	-----	-----	-----	-----	5	40	−58.2	-----	-----	-----	-----	-----	-----	-----	-----	-----

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.

[1] Army.
[2] Operated by Massachusetts Institute of Technology.
[3] Navy.
[4] Soundings made by U. S. C. G. cutters *Champlain* and *Chelan* of International Ice Patrol. The observations at sea were made in an area extending from latitudes 40° to 44° N. and from longitudes 47° to 53° W. Humidity data will be published at a later date.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels, also, the humidity data are not used in daily observations when the temperature is below −40° C.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during May 1939*

[Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second (superior figures indicate number of observations)]

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)		Albuquerque, N. Mex. (1,554 m.)		Atlanta, Ga. (302 m.)		Billings, Mont. (1,095 m.)		Boise, Idaho (850 m.)		Brooklyn, N. Y. (15 m.)		Brownsville, Tex. (7 m.)		Buffalo, N. Y. (220 m.)		Burlington, Vt. (132 m.)		Charleston, S. C. (18 m.)		Cheyenne, Wyo. (1,873 m.)		Chicago, Ill. (192 m.)		Cincinnati, Ohio (157 m.)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	153	3.4^{31}	247	2.9^{31}	253	1.6^{29}	333	2.2^{31}	301	2.5^{31}	186	4.3^{29}	135	5.2^{31}	257	3.6^{31}	257	1.0^{31}	154	1.6^{31}	207	0.6^{30}	170	0.4^{31}	241	1.1^{31}
500					245	2.2^{29}					238	4.7^{29}	138	7.3^{31}	260	5.4^{31}	275	2.3^{31}	184	4.0^{29}			209	1.3^{31}	239	2.8^{31}
1,000	155	4.3^{31}			235	3.1^{29}			294	3.8^{31}	271	5.5^{29}	150	5.9^{30}	262	7.5^{30}	277	4.1^{30}	206	2.8^{28}			238	3.1^{31}	245	2.8^{31}
1,500	172	4.1^{31}			236	3.7^{29}	300	3.0^{30}	305	3.8^{31}	283	6.9^{29}	149	3.7^{27}	261	7.9^{29}	273	6.4^{30}	239	2.8^{26}			247	4.0^{31}	246	3.0^{28}
2,000	203	5.3^{27}	245	3.8^{31}	237	4.2^{27}	284	2.6^{29}	305	3.4^{31}	288	8.1^{27}	148	1.0^{21}	269	9.0^{27}	273	8.4^{27}	270	3.5^{26}	190	1.2^{30}	254	4.9^{29}	275	3.4^{25}
2,500	228	5.8^{25}	238	4.1^{31}	256	4.5^{24}	262	2.8^{29}	301	2.0^{30}	294	9.0^{25}	332	0.2^{20}	283	8.3^{23}	271	8.4^{20}	271	4.2^{25}	217	2.2^{30}	271	4.8^{29}	269	4.3^{23}
3,000	238	6.2^{25}	245	4.1^{31}	264	4.5^{23}	259	5.2^{23}	258	2.7^{29}	297	9.2^{22}	293	0.8^{18}	296	8.7^{17}	282	8.8^{16}	260	5.3^{24}	236	2.9^{30}	284	4.7^{25}	276	5.6^{18}
4,000	258	6.6^{23}	260	6.7^{31}	259	5.0^{20}	279	6.4^{18}	255	3.1^{22}	307	12.8^{15}	310	3.3^{12}	300	12.7^{10}			276	7.2^{20}	261	5.7^{27}	272	5.5^{16}	303	7.0^{14}
5,000	281	8.4^{21}	259	10.2^{29}	280	6.1^{16}	287	8.5^{16}	238	5.6^{18}	302	11.3^{10}	295	5.2^{11}	303	15.5^{10}			258	7.0^{14}	258	7.9^{22}				
6,000	282	9.0^{17}	255	12.2^{26}	271	4.7^{13}	288	7.0^{14}	244	6.3^{10}			286	8.2^{10}							253	10.2^{18}				
8,000	295	7.5^{13}	258	13.0^{21}			294	9.0^{11}																		
10,000	297	9.9^{11}	250	18.8^{13}																						
12,000	275	11.5^{11}	256	20.6^{13}																						

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)		Fargo, N. Dak. (283 m.)		Greensboro, N. C. (271 m.)		Havre, Mont. (766 m.)		Houston, Tex. (21 m.)		Huron, S. Dak. (393 m.)		Las Vegas, Nev. (570 m.)		Little Rock, Ark. (82 m.)		Medford, Oreg. (410 m.)		Miami, Fla. (10 m.)		Minneapolis, Minn. (261 m.)		Nashville, Tenn. (194 m.)		New Orleans, La. (19 m.)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	269	3.2^{31}	293	1.4^{31}	200	2.8^{29}	280	3.3^{30}	139	4.3^{30}	264	0.5^{31}	210	3.0^{31}	149	0.9^{31}	298	2.6^{30}	112	4.5^{31}	223	1.8^{30}	201	1.5^{29}	142	0.8^{29}
500			291	1.5^{31}	211	3.9^{29}			142	4.5^{30}	307	7.5^{31}			188	1.4^{31}	300	2.6^{30}	116	5.6^{31}	223	2.2^{30}	210	1.5^{29}	183	1.9^{29}
1,000			274	2.2^{31}	225	4.6^{29}	274	4.8^{30}	152	2.2^{28}	266	0.5^{31}	221	3.0^{31}	212	2.5^{29}	310	2.5^{30}	131	3.1^{30}	220	3.1^{29}	240	2.2^{29}	212	2.0^{28}
1,500	253	4.8^{31}	267	3.7^{30}	245	3.9^{29}	268	5.7^{30}	182	0.6^{28}	225	1.8^{30}	214	3.5^{31}	222	3.1^{29}	291	1.6^{30}	162	1.5^{26}	234	4.6^{28}	238	3.4^{29}	245	2.2^{26}
2,000	255	5.4^{31}	261	4.7^{30}	273	3.9^{29}	271	6.5^{29}	250	0.9^{26}	233	3.7^{30}	221	2.8^{31}	246	2.9^{25}	221	1.6^{29}	237	2.7^{22}	255	5.5^{26}	250	3.1^{27}	306	2.0^{23}
2,500	257	5.2^{31}	248	7.0^{24}	291	4.3^{27}	271	7.4^{25}	264	0.8^{23}	250	4.8^{30}	241	3.3^{31}	274	3.0^{23}	199	2.8^{29}	253	2.6^{22}	266	6.7^{25}	251	3.7^{27}	305	2.7^{19}
3,000	260	5.8^{30}	261	8.0^{23}	280	4.4^{21}	259	5.8^{18}	277	2.3^{22}	260	5.4^{29}	246	4.5^{31}	290	4.1^{21}	211	3.6^{27}	241	2.8^{20}	276	6.9^{22}	247	2.9^{21}	324	4.3^{17}
4,000	259	7.2^{30}	269	10.8^{19}	284	5.3^{16}	258	9.0^{13}	292	1.6^{16}	278	7.2^{21}	248	5.2^{27}	299	4.6^{17}	237	4.0^{18}	239	2.9^{16}	286	10.0^{17}	328	3.7^{17}	328	5.8^{16}
5,000	259	9.6^{26}	273	12.9^{13}	275	5.7^{14}			284	3.0^{16}	288	8.3^{20}	253	6.2^{27}	285	4.6^{15}	242	5.7^{16}	251	2.3^{14}	282	10.6^{14}	334	6.2^{12}	315	6.4^{14}
6,000	266	11.5^{24}	281	14.0^{10}	303	8.4^{10}			293	5.3^{13}	280	8.8^{16}	256	7.6^{24}	291	5.7^{13}	233	8.4^{13}	257	1.3^{10}	283	13.2^{10}			307	7.9^{10}
8,000	257	11.7^{18}									290	9.5^{15}	284	12.0^{17}	286	6.8^{10}	240	10.9^{11}								
10,000											294	7.8^{13}	266	18.7^{11}												
12,000											265	7.4^{12}														
14,000											285	6.4^{11}														

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)		Oklahoma City, Okla. (402 m.)		Omaha, Nebr. (306 m.)		Reno, Nev. (1,346 m.)		St. Louis, Mo. (170 m.)		Salt Lake City, Utah. (1,294 m.)		San Diego, Calif. (15 m.)		San Juan, P. R. (16 m.)		Sault Ste. Marie, Mich. (198 m.)		Seattle, Wash. (14 m.)		Spokane, Wash. (603 m.)		Washington, D. C. (10 m.)		Winslow, Ariz. (1,488 m.)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	261	5.7^{30}	168	3.9^{30}	181	2.1^{31}	203	1.5^{31}	171	1.7^{30}	303	1.3^{31}	280	4.3^{31}	91	6.5^{31}	262	2.2^{30}	274	2.8^{28}	237	3.0^{31}	208	0.9^{31}	242	4.9^{31}
500	272	5.2^{30}	172	4.1^{30}	183	1.9^{31}			174	2.2^{30}			289	3.7^{31}	102	9.3^{31}	264	2.6^{30}	253	2.0^{28}			227	2.2^{31}		
1,000	276	3.4^{29}	175	3.7^{30}	185	2.2^{31}			188	2.4^{28}			303	2.6^{27}	119	7.5^{31}	239	3.2^{27}	229	2.8^{28}	237	3.7^{31}	243	3.7^{30}		
1,500	258	2.8^{29}	193	4.1^{29}	208	2.3^{31}	216	1.8^{31}	226	2.1^{27}	313	1.5^{31}	292	3.2^{25}	118	6.0^{30}	284	4.8^{27}	221	2.8^{26}	235	3.5^{31}	270	4.8^{29}		
2,000	256	2.1^{28}	221	4.5^{27}	235	2.8^{31}	225	2.6^{31}	236	2.9^{27}	276	1.8^{31}	277	3.9^{25}	108	4.6^{23}	288	7.8^{24}	197	3.1^{22}	226	4.5^{29}	279	6.4^{27}	233	4.9^{31}
2,500	249	2.5^{28}	234	4.8^{26}	273	3.1^{30}	222	2.3^{31}	283	2.6^{26}	265	2.4^{31}	273	4.8^{25}	103	3.5^{14}	301	9.4^{19}	214	3.7^{23}	231	4.5^{25}	290	6.4^{26}	235	4.4^{31}
3,000	253	2.3^{28}	245	5.4^{25}	280	4.0^{28}	228	2.7^{31}	298	5.4^{31}	258	2.3^{30}	268	5.7^{25}			304	11.7^{16}	214	5.6^{19}	242	5.7^{23}	294	6.4^{24}	233	4.4^{31}
4,000	256	3.9^{27}	262	6.1^{20}	281	6.5^{25}	227	4.6^{31}	317	4.4^{16}	253	3.3^{22}	263	8.1^{22}			310	15.5^{12}	222	7.6^{16}	253	7.3^{19}	306	8.6^{18}	248	6.3^{29}
5,000	258	5.2^{24}	277	6.0^{19}	276	8.0^{23}	235	5.7^{28}	313	6.4^{11}	251	5.5^{20}	260	11.4^{21}					235	9.3^{13}	249	8.3^{12}	301	9.1^{13}	250	8.2^{28}
6,000	267	6.8^{18}	277	6.8^{16}	285	8.6^{21}	281	4.8^{23}			269	5.1^{17}	263	12.5^{20}											249	11.8^{27}
8,000	306	5.9^{10}	289	7.3^{12}	266	7.3^{16}	281	6.5^{17}																	252	15.5^{23}
10,000			270	10.2^{12}	265	7.0^{13}	282	14.9^{12}																	265	17.2^{14}
12,000					272	9.6^{11}																			266	20.6^{11}

TABLE 3.—*Maximum free-air wind velocities (M. P. S.) for different sections of the United States based on pilot-balloon observations during May 1939*

Section	Surface to 2,500 meters (m. s. l.): Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Between 2,500 and 5,000 meters (m. s. l.): Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Above 5,000 meters (m. s. l.): Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	34.7	WSW	2,200	10	Syracuse, N. Y.	39.0	WNW	4,180	18	Syracuse, N. Y.	56.0	NW	14,920	30	Cleveland, Ohio.
East-Central [2]	29.8	WSW	770	28	Cincinnati, Ohio	31.8	N	5,000	2	Nashville, Tenn.	38.0	W	10,290	5	Knoxville, Tenn.
Southeast [3]	25.7	W	2,080	9	Jacksonville, Fla.	31.0	W	5,000	1	Charleston, S. C.	43.6	WNW	6,570	16	Tampa, Fla.
North-Central [4]	31.8	W	1,910	10	Detroit, Mich.	35.2	NW	4,640	17	Sault Ste. Marie, Mich	37.2	N	12,040	15	Huron, S. Dak.
Central [5]	33.9	SSW	1,230	6	Wichita, Kans.	33.6	WNW	4,660	10	Indianapolis, Ind.	50.0	SSW	9,440	7	Omaha, Nebr.
South-Central [6]	32.7	SW	1,730	23	Amarillo, Tex.	29.0	W	4,560	8	Dallas, Tex.	73.0	WSW	18,350	20	Abilene, Tex.
Northwest [7]	47.7	WNW	1,700	19	Billings, Mont.	48.3	W	3,950	9	Butte, Mont.	49.0	NNE	11,220	5	Medford, Oreg.
West-Central [8]	31.0	SSW	2,500	21	Modena, Utah	58.7	SSW	3,080	21	Ely, Nev.	80.0	SSW	16,630	8	Redding, Calif.
Southwest [9]	33.7	SW	2,280	22	Las Vegas, Nev.	33.0	NW	5,000	23	Sandberg, Calif.	60.8	SW	10,970	13	Albuquerque, N. Mex.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during May 1939, classified according to the potential temperatures (10-degree intervals between 290° and 399° A.) with which they are identified (based on radiosonde observations)*

Potential temperatures	Fargo, N. Dak.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Nashville, Tenn.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Oakland, Calif.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Oklahoma City, Okla.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Omaha, Nebr.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Sault Ste. Marie, Mich.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	St. Georges, Bermuda: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Washington, D. C.: Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299																								
300–309																6	6.7	−47.0				1	6.9	−42.0
310–319	7	9.7	−54.6				3	7.8	−33.3				2	10.0	−55.5	6	9.3	−53.0				3	9.0	−48.3
320–329	13	10.8	−57.5	10	9.8	−47.1	16	9.5	−44.5	6	11.3	−52.8	6	10.1	−49.7	17	10.7	−57.4	8	9.0	−40.1	9	10.5	−58.1
330–339	21	11.8	−61.6	16	11.5	−56.8	17	11.2	−54.0	18	11.4	−55.8	18	11.3	−55.2	16	11.6	−58.2	25	12.0	−61.1	10	11.5	−60.5
340–349	8	12.5	−60.9	23	12.6	−60.6	12	12.0	−55.6	20	12.3	−52.2	18	12.4	−59.4	10	12.3	−59.8	17	13.1	−65.9	9	13.0	−64.7
350–359	5	13.0	−61.4	5	13.4	−62.6	7	12.8	−57.0	8	13.2	−60.1	5	13.0	−58.8	4	12.8	−58.8	5	13.9	−68.0	3	13.6	−64.0
360–369	2	14.2	−64.5	5	14.3	−64.4	2	13.6	−58.0	7	13.6	−59.9	1	13.9	−64.0	6	13.5	−59.2	5	14.3	−66.4	1	11.7	−54.0
370–379	2	15.2	−69.5	2	15.8	−67.5	3	14.0	−57.0	2	13.9	−55.0	4	14.4	−61.2	4	14.5	−61.5	2	15.4	−70.0	1	14.4	−59.0
380–389	7	15.2	−63.4	1	16.0	−71.0	1	13.7	−51.0				3	15.5	−63.3	3	14.6	−59.3	3	16.0	−73.3	1	16.4	−73.0
390–399	2	15.8	−60.0	3	14.9	−61.3	1	14.8	−56.0	1	15.9	−63.0	1	15.8	−63.0	2	15.6	−63.4	1	15.9	−66.0			
All (weighted means)		12.2	−60.4		12.3	−58.4		11.2	−51.6		12.3	−55.5		12.2	−57.3		11.5	−54.7		12.6	−61.5		11.7	−59.9
Mean potential temperature		342.4			345.5			339.5			346.0			344.8			338.9			341.6			336.5	